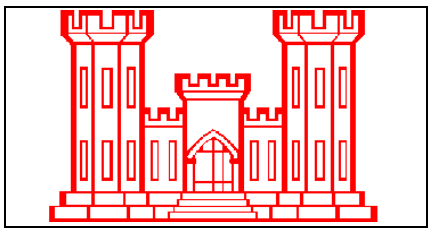

US Army Corps of Engineers
North Atlantic Division

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Annual Water Quality Management Report

January 2001

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NORTH ATLANTIC DIVISION
WATER QUALITY MANAGEMENT REPORT
(2000)

ABSTRACT

This water quality management report is prepared in accordance with the requirements of CECW-EH-W memo dated 3 November 1998. The report summarizes the activities of the North Atlantic Division's overall Water Quality Management Program. In general, Division water quality management goals are for projects to be in compliance with Federal and State Water Quality Standards and attainment of project purposes. Water quality enhancement has been attained for all projects in the NAD area.

Items included in this report are technical capabilities and responsibilities in the division and district offices, relationships between water quality and water control management activities, contracted workload, laboratory facilities, data management systems, training, coordination with other agencies, research and development needs, and special studies completed or required.

1. **Technical Capabilities and Staff**

A) NAD Office

Technical Engineering and Construction Division - Water Management Team

NAME	OFFICE SYMBOL	POSITION	TELEPHONE
Andrew Petallides	CENAD-ET-ET	Hydr Engr/Team Leader	(718)491-8750
Alfred K. Tai	CENAD-ET-ET	Hydraulic Engineer	(718)491-8748
Ralph LaMoglia	CENAD-ET-ET	Hydraulic Engineer	(718)491-8746

B) Philadelphia District.

a) Planning Division - Environmental Resources Branch (Reservoir Water Quality Unit)

NAME	OFFICE SYMBOL	POSITION	TELEPHONE
Jerry Pasquale	CENAP-PL-E	Biologist/Branch Chief	(215)656-6560
Gregory Wacik	CENAP-PL-E	Ecologist	(215)656-6561

b) Engineering Division - Hydrology and Hydraulics Branch

NAME	OFFICE SYMBOL	POSITION	TELEPHONE
George A. Sauls	CENAP-EN-H	Hydraulic Engineer /Branch Chief	(215)656-6678
Frank Cook	CENAP-EN-H	Hydraulic Engineer	(215)656-6680
Christine Tingle	CENAP-EN-H	Hydraulic Engineer	(215)656-6685
Yvette Boggs	CENAP-EC-H	Hydrologic Technician	215-656-6685

C) Baltimore District.

Water Control & Quality Section (Engineering Division), Geotechnical & Water Resources Branch.

NAME	OFFICE SYMBOL	POSITION	TELEPHONE
Rich Olin	CENAB-EN-GW	Super. Hydraulic Engr.	(410)962-6769
Bill Haines	CENAB-EN-GW	Hydraulic Engineer	(410)962-6768
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Stan Brua	CENAB-EN-GW	Hydraulic Engineer	(410)962-4894
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Doc Barlock	CENAB-EN-GW	Hydrologic Tech.	(410)962-5124
Debra Strickland	CENAB-EN-GW	Hydraulic Engineer	(410)962-5127

D) Norfolk District

Engineering, Construction, and Operations Division-- Engineering Services Branch, Hydraulics and Hydrology Section

NAME	OFFICE SYMBOL	POSITION	TELEPHONE
Larry Holland	CENAO-TS-EW	Hydraulic Engineer	(757) 441-7774
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William Whitt	CENAO-CO-GL	Head Dam Operator	(540) 962-1138
William Siple	CENAO-CO-GL	Engineering Tech.	(540) 962-1138

E) New York District

Operations Division--CENANOP-SD

NAME	OFFICE SYMBOL	POSITION	TELEPHONE
Monte Greges	CENANOP-SD	Supv. Oceanographer	(212)264-5620
Oksana Yaremko	CENANOP-SD	Environmental Engr.	(212)264-9268
Joseph Olha	CENANOP-SD	Oceanographer	(212)264-5621
Steven Knowles	CENANOP-SD	Oceanographer	(212)264-1853
Mike Harris	CENANOP-SD	Oceanographer	(212)264-1585
Beth Nash	CENANOP-SD	Oceanographer	(212)264-5622
Thomas Wyche	CENANOP-SD	Physical Lab Tech.	(212)264-1851
Linda Bussey	CENANOP-SD	Secretary	(212)264-2021

F) New England District

Water Management Section

NAME	OFFICE SYMBOL	POSITION	TELEPHONE
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Environmental Resources Section

NAME	OFFICE SYMBOL	POSITION	TELEPHONE
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Peter Trinchero	CENAE-EP-ER	Biologist	(978) 318-8114

Technical Missions Branch

NAME	OFFICE SYMBOL	POSITION	TELEPHONE
Bruce Williams	CENAE-CO-TM	Park Manager	(978) 318-8168

2. Relationship Between Water Quality and Water Control Management Activities

A) Philadelphia District.

Stratification monitoring was performed at four of five District Reservoirs - Blue Marsh, Beltzville, Prompton, and F.E. Walter to identify and monitor various water quality conditions within each reservoir. Additional stratification monitoring at Blue Marsh and Beltzville Reservoirs was performed to determine selective withdrawals for maintenance of downstream water temperatures. Both the contractor and personnel from the Hydrology and Hydraulics Branch conducted this sampling. The Water Quality Contractor provides stratification reports directly to the Districts Hydrology and Hydraulics Branch.

The relationships between water quality and water control management activities are periodically reviewed when a water quality or water control management concern arises.

B) Baltimore District

Water Control and Water Quality Management are both responsibilities of the Water Control and Quality Section, Geotechnical & Water Resources Branch, Engineering Division.

C) Norfolk District.

The Civil Works Section of the Engineering Branch, Technical Services Division, has overall responsibility for District Water Control Management and Water Quality Activities at the Gathright Dam and Lake Moomaw Project.

D) New York District.

NYD manages and studies water quality concerns which are primarily related to dredging and dredged material disposal operations associated with civil works projects, and secondarily related to various associated studies.

E) New England District.

New England District has no reservoirs with selective withdrawal capabilities. Water quality coordination is for the operation of NAE's reservoir projects is required only for special operations such as past low-flow augmentation storage at Thomaston Dam.

3. Contracted Workload

A) NAD Office.

The Division office has had no contracted workload in the past and there is none planned in the immediate future.

B) Philadelphia District.

All water quality monitoring, other than stratification monitoring was performed through contract with VERSAR, Inc. of Columbia, Maryland.

C) Baltimore District.

Phytoplankton and zooplankton samples were collected from selected District reservoir projects to assist in evaluating their productivity, aquatic food-chain dynamics, and overall water quality. The samples were sent to Aquatic Analysts in Wilsonville, Oregon for identification, enumeration, calculation of biologic indices, and interpretation of the results.

D) Norfolk District.

For 2000, the District contracted with one commercial laboratory for the analysis of water samples obtained from the Gathright Dam and Lake Moomaw project by project personnel. The contract provides for the analysis of nutrients, iron and manganese, and bacteriological parameters.

E) New York District.

Bioassay/bioaccumulation testing along with other biological and chemical analyses are contracted out to commercial testing laboratories. Feasibility studies for alternatives to ocean disposal and for monitoring of the HARS have been contracted to private contractors and universities, USACOE Waterways Experiment Station (CEWES), and other Federal Agencies. Most contracts, IAO's, and Interagency Agreements are managed by CENANOP-SD staff.

E) New England District

All analytical work for the water quality program is contracted out to various companies including Alpha Analytical, Microbac, Biological Services, Eastern Analytical, Aquacheck Water Testing, Northeast Labs, Spectrum Analytical, and Battelle.

4. Laboratory Facilities

A) NAD Office. None

B) Philadelphia District.

All Laboratory work for reservoir water quality was conducted at two facilities. Blue Marsh Laboratory of Douglassville, Pennsylvania performed analysis of drinking water samples and bacteria. Kemron Environmental Services of Marietta, Ohio performed the remaining analyses.

The State of Pennsylvania does not currently have sediment standards established. As a result, concentrations of priority pollutants in sediment samples are compared to Philadelphia District identified reference literature sediment guidelines found in the following:

Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environmental Management, 19:881-97.

MacDonald, D.D., S.L. Smith, M.P. Wong, and P. Mudrock. 1992. The development of Canadian marine environmental quality guidelines. Ecosystem Sciences and Evaluation Directorate, Conservation and Protection, Environmental Canada, Ottawa, Ontario.

New Jersey Department of Environmental Protection. 1984. Cleanup standards for contaminated sites, N.J.H.C. 7:260. February 3, 1992. Trenton, New Jersey.

C) Baltimore District.

A laboratory facility is located in the Water Control & Quality Section at the City Crescent Building in Baltimore.

D) Norfolk District.

The Norfolk District has no laboratory facilities. For 2000, OLVER, INC., under contract with the Norfolk District, performed water quality analyses on samples from the Gathright Project.

Personnel from the Corps of Engineers, South Atlantic Division Laboratory inspected OLVER Inc. in January 1997 and concluded that the laboratory has the capabilities to satisfactorily perform the contracted tests and measurements.

E) New York District.

CENANOP-SD maintains a sampling and storage facility at Caven Point, New Jersey which is primarily used for preparation, limited testing and storage of dredged material and water samples. The facility contains state-of-the art equipment for sediment grain size analysis and refrigerated storage for sediment samples, including cores. Marine borer test boards, used in harborÄwide monitoring, are also prepared at this facility

F) New England District

Data had been stored on the Laboratory Information Management System (LIMS), and transferred to users in PC-compatible spreadsheets. In FY99 NAE purchased GIS\Key software for storing, retrieving, and analyzing water quality (and HTW) data. Use of GIS\Key began in FY00, but was discontinued at the end of the year because of the expense and Corps plans to ultimately switch to DASLER. We are currently storing data on spreadsheets until the eventual implementation of DASLER.

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5. Data Management Systems.

A) Philadephia District

VERSAR, Inc. submits annual individual reservoir water quality and database trend analysis reports to CENAP-PL-E. The Contractor directly inputs individual reservoir data into the respective reservoir databases.

B) Baltimore District.

Water Control Data System Implementation. The Water Control Data System (WCDS) is implemented on the Baltimore District LAN and presently includes the following equipment on its network: four UNIX workstations (two Sun Sparcstation 20 units and two Sun Sparc Ultra 1 units) and one Compac 486 PC server. Other equipment on the network include an Integral Systems DOMSAT Receive Station, one Hewlett Packard Laser Jet 5M printer, and one Hewlett Packard Scan Jet IIc desktop scanner. Two DELL Latitude laptop PC's are used for remote access to the WCDS. Real-time Doppler weather radar images are obtained via Data Transmission Network Corp. Weather.

Significant FY 2000 activities regarding the WCDS are as follows:

1. Improvements for displaying water control data and information continued as web server capabilities were expanded.

2. The Sun Sparc Ultra 1 units were upgraded with additional hard disk storage to accommodate the WCDS modernization efforts.

3. WCQS staff completed the process of replacing the section's eight X-terminals with high-end PCs running X-Windows emulation (EXCEED). This has eliminated the need for water control managers to have both a PC and an X-terminal.

4. The WCDS Continuity of Operations Plan (COOP) with CENAP was successfully tested in October 2000.

5. Software and hardware systems continued to be tested during the first quarter of FY00 to address possible Y2K compliance issues. No significant problems were encountered.

6. During FY 00, WCQS staff actively participated in the ongoing WCDS modernization efforts. Efforts included: participation in monthly conference calls with OCE, HEC, and personnel from the other WC offices; and continued participation on the Corps Users Review Group (CURG) and on the System Design and Test (SDT) team developing a model for flood impact assessment. Test version 2 of the Corps Water Management System (CWMS) software was installed in Baltimore in June 2000. We have also done some web page development for HEC.

7. The Data Management and Analysis System for Lakes, Estuaries, and Rivers (DASLER) was installed in the Baltimore District in 2000 to manage and report water-quality data. This is a Windows based program interface to an Oracle database that is capable of supporting physical/chemical and biological data. The program is capable of generating a wide variety of plots and tabular reports. Water Control and Quality Section personnel have developed programs to convert data currently stored on spreadsheets and as ASCII files to the DASLER database.

8. Use of the Global Positioning System (GPS) has been adopted in 2000 offering precise, global, and continuous positioning of water quality sampling stations in and around Corps projects. These points provide a common base of reference correlating longitude and latitude, mapping and charting land record systems throughout the Nation.

C) Norfolk District.

All data is obtained, analyzed, reduced, and stored in digital format. The lake monitoring data is collected with a Hydrolab 5200A unit and stored on District personal computers.

D) New York District.

Sediment testing results for all analyzed projects are input into a network Oracle database. CENANOP-SD also maintains an up-to-date computerized summary of dredging and ocean disposal activities (federal channel and private applicant volumes dumped at the Mud Dump Site and HARS, dates of disposal, current permits). The GIS database is potentially useful for designating new or replacement ocean disposal sites and Borrow Pits, and as a support tool for the New York Bight Monitoring and Modeling study. Software for evaluating bioassay, bioaccumulation and barge overflow data have been developed for CENANOP-SD and are being honed for use in all data compilation and review.

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E) New England District.

Water quality related training and conferences in WMS included the following:
Ms. Heather Rausch attended the Engineering Design of Wetlands course in March in Orlando,

Florida. In August Messrs. Townsend Barker and Heather Rausch participated in NAD Water 2000 seminar on water quality and water management in Norfolk, Virginia and Mr. Donald Wood went to Newport, Rhode Island for the SSFATE workshop on modeling of contaminants in dredged material in September. There was no other formal water quality-related training in FY00.

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6. Training

A) NAD Office.

Three CENAD personnel were involved in NAD Seminar 2000 on Water Quality, and Water Management in Norfolk, Virginia.

B) Philadelphia District.

No official training was attended this year. However, numerous conferences and meetings were attended that provided training in an informative setting and were directly related to operations of District Reservoirs. These include:
The Annual Pennsylvania Lake Management Society Conference Water 2000
The NAD Seminar 2000 on Water Quality and Water Management in Norfolk, Virginia
The Blue Marsh Reservoir Water Quality Meeting
The Beltzville Reservoir Water Quality Meeting

C) Baltimore District.

The following are training courses taken by CENAB Water Control staff – FY00.

COURSE TITLE	NUMBER ATTENDING
ESRI Basic of ArcView	3
ESRI Basic of ArcInfo	3
ESRI Introduction to ArcView GIS	1
ESRI Spcial Hydrology Using ArcView GIS	2
MS Excel	1
MS PowerPoint	1
Risk management	1
LEAD Training	1
Mid-Atlantic Water Pollution Biology Workshop	1
Corps of Engineer Water 2000 Seminar	1
Tri-Service CADD/GIS Symposium	1
EIT Review Course	1
Engineering Design & Synthesis II	1
Professional Engineering Exam Review Class	1

D) Norfolk District.

CENAO personnel were involved NAD Seminar 2000 on Water Quality, and Water Management.

E) New York District.

No CENAN personnel were involved in water quality training during 2000.

F) New England District.

CENAE personnel were involved NAD Seminar 2000 on Water Quality, and Water Management.

7. Interagency Coordination.

A) Philadelphia District.

Data on file with the District is made available to all that make the request. CENAP-PL-E regularly sends annual reservoir water quality monitoring data to the Delaware River Basin Commission (DRBC), Pennsylvania Fish and Boat Commission, Western Berks Water Authority and Pennsylvania Department of Environmental Protection (PADEP). Results of the drinking water analyses are sent on a quarterly basis to the PADEP. Zebra mussel monitoring data sheets are sent on an annual basis to PADEP. Additional copies of the Blue Marsh Reservoir Annual Water Quality Monitoring Report are sent to Albright College. Additional copies of the Beltzville Reservoir Annual Water Quality Monitoring Report are sent to the Wildlands Conservancy in Emmaus, Pennsylvania; the Lehigh River Watch/Parkland High School in Orefield, Pennsylvania; Lehigh University, and the Unites States Geological Survey.

The Philadelphia District presented all aspects of its water quality monitoring program and results to Federal, State, and local governments and private entities at the following venues:

The Blue Marsh Reservoir Water Quality Meeting
The Blue Marsh Reservoir Town Hall Meeting
The Lehigh River Study Team Meeting (F.E. Walter and Beltzville Reservoir data)
Friends of Prompton Lake Meeting

B) Baltimore District.

The Baltimore District maintains contact with the Maryland Department of Natural Resources, Pennsylvania Department of Environmental Protection and Susquehanna River Basin Commission, providing them with information of water quality operations that may impact water quality in Corps lakes or downstream of projects. These notifications are made for any operation that deviates from the approved regulation plan and includes gate shutdowns for conduit inspections and lake drawdowns for maintenance.

Water Control and Quality Section also coordinates water quality activities with other agencies, including the Maryland Department of Freshwater Fisheries, the Susquehanna River Basin Zebra Mussel Monitoring Network, the Pennsylvania Fish & Boat Commission, the Chesapeake Watermans Association, and the Mineral County (WV) Parks & Recreation Commission.

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C) Norfolk District.

Water quality efforts are coordinated with the state of Virginia, National Weather Service, U.S. Geological Survey, U.S. Forest Service, U.S. Fish and Wildlife, and EPA Region III.

D) New York District.

CENANOP-SD coordinates regularly with other state and federal regulatory and Scientific/technical agencies through regular meetings, letters and phone conversations. State agencies are contacted regularly to review private applicant and federal sampling and testing plans, and many concerns and questions are verbalized at Harbor Estuary Program (HEP) meetings where various tiers of involvement cover technical, management and policy information and eventual decisions.

Currently, a Remediation Workgroup (technically part of the HEP) was reformed in late 2000 to review EPA Region 2's proposed technical evaluation framework for bioaccumulation data in our ocean disposal testing program.

E) New England District.

Data on file with the District is made available to all who request it. Results of drinking water analyses are sent to the appropriate State agency within 24 hours. Beach analyses at New Hampshire projects are sent to the New Hampshire Department of Environmental Services monthly. Water quality monitor data from the Town Brook tunnel is sent to Massachusetts monthly. NAE produces an Annual Water Quality Report in its own format, and copies are sent to State agencies in all 6 New England States, the U.S. EPA, and interested private organizations.

8. Research and Development Needs.

A) New York District

1. Capping effectiveness

a. Problem: Define the effectiveness of capping procedures at isolating contaminated sediments.
b. Product Desired: information and data on effects of layering caps; long term integrity of caps; effectiveness of different types of caps; suitability of final cap material.
c. Assessment: will affect material which requires capping in a confined disposal facility or which may be eligible in the future for capping at an ocean disposal site; also helpful in assessing certain impacts of placing a remediation "cap" at the HARS.
d. POC: Monte Greges, CENANOP-SD; 212- 264-5620

2. Dioxin Effects

a. Problem: Refine understanding of dioxin effects and how to mitigate for its disposal.
b. Product desired: establishment of realistic evaluative framework and scientifically based criteria for TCDD and other isomers; applicable decontamination technologies; effects of trophic transfer.
c. Assessment: affects large volume of material proposed for dredging and disposal; will have huge impact on all dredging in harbor; costs: $400,000 to 1.5 million.
d. POC: Monte Greges, CENANOP-SD; 212-264-5620

3. Bioaccumulation

a. Problem: Establish appropriate and defensible bioaccumulation criteria for use in the District's ocean disposal testing program.
b. Product Desired: need valid lists of scientifically based criteria for all contaminants evaluated in our dredged material management program.
c. Assessment: will affect all material proposed for placement at the HARS from the Port
d. POC: Monte Greges, CENANOP-SD: 212-264-5620

B) Philadelphia District

1a. Problem - Bacteriological Contamination at the Reservoirs.
1b. Product Desired - A detailed evaluation of water quality data taken at the reservoirs throughout the years in combination with an investigation into their current and past land uses is desired to assess contamination trends and locate point and non-point sources of pollution.
1c. Assessment of Problem - Fecal coliform levels have periodically exceeded the limit throughout the years at various reservoir sites
A database was developed in 1996 using all historical reservoir data currently available. Fecal coliform data trends were also developed for the reservoirs.

1d. POC: Gregory Wacik, CENAP-PL-E: 215-656-6561

2a. Problem – Lehigh River water quality
2b. Product Desired – A watershed model to evaluate the water quality of the Lehigh River and the affect the F.E.Walter and Beltzville reservoir operations have on it.
2.c Assessment of Problem - Currently a cooperative effort amongst Federal, State, and private entities is in place to define water quality conditions in the Lehigh River.
2d. POC: Gregory Wacik, CENAP-PL-E: 215-656-6561

3.a Problem – Nutrient loading and algal biomass at Blue Marsh Reservoir
3.b Product Desired – An accurate assessment of individual sub-watershed loadings entering the reservoir so restoration efforts can focus on those watersheds with the highest nutrient loads.
3.c Assessment of Problem – Nutrient loading from the Blue Marsh Reservoir watershed is adversely affecting the water quality of the main reservoir body.
3d. POC: Gregory Wacik, CENAP-PL-E: 215-656-6561

C) Baltimore District

Remedy gas supersaturation in stilling basin of Jennings Randolph Lake.

a. Problem - Gas supersaturation occurs when large releases are made, resulting in injuries or death to some fish species.
b. Product Desired - Recommendation for an economical solution.
c. Assessment of Problem - Problem occurs about 15-30 days per year. Cost of problem is unknown.
d. POC: Mr. Stan Brua, CENAB-EN-GW: 410- 962-4894.

D) New England District

a. Problem - Bacterial Contamination of Beaches after Rainstorms
b. Product Desired - Means to determine when to close and reopen beaches after rainstorms without having to wait one to two days for sampling results.
c. Assessment of Problem - High bacteria counts occur at beaches most often after it rains, but it takes one to two days to get sampling results; this delay can be even longer on weekends when demand for access to the beaches is highest. The result can be that beaches are open when they shouldn't be and closed unnecessarily. An administrative closure protocol based on past experience is needed.
NAE has been experimenting with closure protocols based on the past rainfall and

bacteria records at the beach.

d. CENAE POC - Townsend Barker, CENAE-EP-EW: 978-318-8621.

E) Norfolk District

a. Problem - Metalimnetic Oxygen minima occuring within the reservoir. This problem frequently appears when releasing cooler water from lower port elevations.
b. Product(s) Desired: A widely applicable, user-friendly computer-based optimization scheme that integrates the combination of chemical, biological and physical (thermal) properties which can be used to minimize the negative impacts on reservoir water quality and tailwater quality.
c. Assessment of the problem: These problems usually occur annually in the late summer and can adversely impact both reservoir and downstream fisheries. No costs were developed since this scheme would be widely applicable for any project with multi-level intake towers.
d. POC – Mark Hudgins, CENAO – TS – EW: 757-441-7107

9. Special Studies.

A) Philadelphia District.

a. Priority Pollutant Testing - In accordance with the CECW-W letter dated 3 June 1983, subject: Reservoir Contamination of Corps Reservoirs, and the NADEN-TH letter dated 16 July 1984, subject: Reservoir Contaminants, CENAP initiated in 1984 a priority pollutant testing program to augment the normal water quality monitoring activities. The 1984 field sampling effort included all priority pollutants listed in the U.S. Environmental Protection Agency's Quality Criteria for Water (Red Book) and its amendments. In 1985, CENAP divided the priority pollutants into 3 groups - Group 1: Volatile Organics, PCBs, and Pesticides; Group 2: Metals and Acid Extractables; and Group 3: Base Neutrals, so that each group would be sampled alternately each year. Group 1 was sampled and analyzed for in July 2000.

b. Benthic Macroinvertebrate Assessments - A monitoring program to assess the benthic macroinvertebrate communities of streams flowing into and out of the reservoirs would help in establishing and comparing the ecological integrity of those surface flows. This data can be used to provide an ecological measure of fluctuating environmental conditions because communities integrate stresses over time. Because these biological communities reflect the overall ecological integrity of a system, the biosurvey results would directly assess the

waterbodies status relative to the Clean Water Act. In addition, this data can help identify pollutant sources entering the reservoir.

The Pennsylvania Fish and Boat Commission, in cooperation with the Philadelphia District, has established a benthic macroinvertebrate sampling regime to monitor water releases from the District's F.E. Walter Reservoir in 1998 and 1999. This work was performed to help evaluate the potential impact water releases have on benthic macro-invertebrate communities and other species. The final report identified no statistically significant impacts to benthic macro-invertebrate communities as a result of white water release

c. Watershed Assessments - In addition to collecting streamflow and rainfall data, watershed assessments for each of the reservoirs should be performed in order to pinpoint contamination sources. The investigations would include current and past land uses within the watersheds.

A multi-agency effort at the local, state and federal level was established in 1995 to develop an Environmental Assessment for the Tulpehocken Creek Watershed, in which Blue Marsh Reservoir is located. Efforts to address pollution concerns in the watershed are ongoing.

Currently, there are federal and state government and private interests in developing a water quality and flow model of the Lehigh River. The Philadelphia Districts F.E.Walter and Beltzville Reservoirs are within the Lehigh River basin. Monies have been secured to begin collecting water quality and flow data for the Lehigh River. A sampling plan is being developed at this time.

d. Comprehensive Watershed Management Plans - The Final Watershed Protection Plan and Environmental Assessment report for Tulpehocken Creek completed in November 1997 described a plan for treating non-point source pollution to improve water quality and restore aquatic habitat and for improving practices to sustain agricultural productivity and profitability. Funding has since become available to the Berks County Conservancy to begin water quality improvements within the watershed. Numerous streambank restoration projects and agricultural best management practices have been implemented to date. Blue Marsh Reservoir water quality is expected to benefit from environmental restoration efforts undertaken in the watershed.

e. Past and Current Water Control/Quality Management of Federal Water Quality Storage in Multi Purpose Projects of the Philadelphia District.

Purpose –
Inclusion of Federal Water Quality Storage at Corps reservoir projects reflects the consideration required by Section 2 (b)(1) of the Federal Water Pollution Control Act Amendments of 1961 (20 June 1961). The legislative history of the provision indicates that water quality inflows and releases assist in meeting the Federal interest of "widespread general and nonexclusive benefits from such increases in low flow".

Present Delaware River Basin Commission Operating Protocols –
The DRBC's reservoir operating protocol and requested water quality releases are based on the judgement that flows below 400 cubic feet per second, dissolved oxygen below 4 mg/l and temperatures above 86 degrees Fahrenheit on the Schuylkill and Lehigh Rivers are detrimental to stream water quality. DRBC also uses reservoir releases from Beltzville and/or Blue Marsh reservoirs toward control of salinity in the estuary. These water releases, whether indicated for dissolved oxygen enhancement in the Schuylkill or Lehigh also provide added fresh water toward salinity repulsion in the estuary. At present DRBC uses a chloride water quality standard at Delaware River Mile 98 in the estuary.

Water Control Management Information Requirement –
Management of this Corps storage to produce the benefits intended is a Corps responsibility. Monitoring and recorded data is required to support both the basis for releases from Federal water quality storage and downstream water quality conditions resulting from water quality releases.

Future Action -
The District is working with DRBC, Philadelphia Electric Company, and United States Geological Survey to collect, report and analyze appropriate monitoring information for use in Corps' reservoir regulation. Recent modeling by the U.S. Geological Survey indicates that the estuary chloride levels that may occur during drought may not be as serious a threat to current ground water supplies as previously estimated. Given this finding there is interest in the potential for reducing flow targets to reduce the frequency of declared drought warnings and emergencies. DRBC release protocols are likely to require reconsideration and revision.

f. Trend Monitoring at all Reservoirs - The database consisting of all water quality data must continue to be updated annually for all four-reservoir sites. In addition, the simple trend analyses developed for all the District Reservoirs should continue to be incorporated into the project summaries.

B) Baltimore District

1) Continue to evaluations of operating procedures continue at Jennings Randolph and Savage River Dam Project in the North Branch Potomac River, and the Tioga-Hammond Lakes project in the Chemung River Basin..

2) Continue to monitor gas supersaturation problem at the Jennings Randolph Lake project.

3) Continue to monitor Dust Alleviation Program at Foster J. Sayers Lake Project.

C) Norfolk District.

The District again prepared in the Spring of 2000 to identify a greenish-yellow organism that had appeared on the reservoir in the springs of 1984 and 1985 after the ice cover melted. However, once again in 2000, the reservoir neither froze nor was the aforementioned organism observed. The District is again prepared to attempt to identify this organism if it appears in the Spring of 2001.

D) New York District

CENAN was not involved in any special studies in 2000.

E) New England District.

a. Priority Pollutant Scans. In FY00 NAE completed reports on priority pollutant scans at four Corps flood control projects – Conant Brook Dam in Massachusetts, and Black Rock, Hancock Brook, and Mansfield Hollow Lakes in Connecticut. Sediment samples from these projects were analyzed for metals, PCBs, pesticides, volatile and semi-volatile organic compounds, dioxins and furans, TOC, and grain size. Overall, levels of EPA priority pollutants at these projects were low and generally indicative of natural background conditions. Some contaminants were found in concentrations high enough to have possible effects on sensitive benthic organisms, but these effects would be minor, and no substances were in high enough concentrations to pose a risk to humans or interfere with uses of the projects or their waters. Although no problem levels of contaminants were found, there were some findings that warrant further investigation. Reported levels of volatile organics at Conant Brook indicated a possible small spill or leak of gasoline, and levels of semi-volatile organics at Black Rock Lake were the highest recorded at any NAE project to date. At neither project were levels high enough to be a problem in themselves, but additional samples were collected in late FY00 to confirm that these were not part of a larger problem. Results will be available in FY01. "Hancock Brook and Black Rock Lakes, Priority Pollutant Scan," March 2000; "Conant Brook Dam, Priority Pollutant Scan," April 2000; and "Mansfield Hollow Lake, Pollutant Scan," September 2000 summarize findings to date.

b. Knightville Dam Fish Passage. As part of restoring historic Atlantic salmon runs, NAE is studying fish passage at Knightville Dam. Restoration efforts on the Westfield River have had very promising results, but returning adults currently have to be transported around the Knightville Dam structure. Although no pool is maintained at the project as a barrier to migration, the slope of the discharge conduit is too great to allow sufficient depth of flow for upstream passage during normal conditions. Downstream passage is not a problem. The remedy the Corps is considering for upstream passage is to construct an inflatable barrier downstream of the outlet works. This barrier would create a pool with a backwater extending into the conduit to allow fish to swim through it. A fish ladder would enable fish to get past the inflatable barrier. The barrier would be deflated so as not to interfere with flood control releases, when flows would be too great for upstream passage anyway. As part of the studies for this project, NAE installed an automatic

water quality monitor (AWQM) at the Knightville discharge during the summer of FY00. The purpose of this AWQM was to confirm that water quality in the river was good and a pool created below the outlet would have conditions favorable for salmon passage or resting. Results have shown that water quality in this pool should not be a problem.

c. Town Brook Tunnel Water Quality. The Water Quality Certificate issued by the Massachusetts DEP for the Town Brook tunnel requires water quality sampling and monthly reporting of results. The 4,000 foot long, deep rock tunnel is a key part of the Town Brook Local Protection Project, and it has sophisticated water quality controls built into it. It is a relief tunnel and only receives major inflows during storm events. Between storms, seawater can enter the tunnel through the outlet twice a day during high tides. The resulting mix of urban storm runoff with saltwater in an enclosed tunnel with minimal flushing (between storms) could easily lead to anaerobic conditions and the generation of hydrogen sulfide. To prevent this, the tunnel has a system of flushing pipes connected by pumps to cascade aerators at the tunnel entrance and exit. In addition, air compressors are connected to diffusers to supply additional dissolved oxygen (DO) in an emergency. AWQM's measuring DO, pH, temperature, and conductivity are connected to these pumps. Every day at a little past midnight, the pumps come on to send water to the AWQM. If the DO is above 6.0 ppm, the system shuts down; however, if it is less than that, the pumps continue to run water over the aeration cascades for an hour when another reading is taken. This reading must be at least 6.5 ppm; otherwise, pumping and aeration continue with hourly checks until 6.5 ppm is achieved. This system can be remotely accessed by computer, and data can be retrieved or the system turned on or off at any time. Each month the previous month's data are retrieved and sent to the DEP.

Data from the tunnel's AWQM showed generally good to excellent DO conditions during FY00. Except for an unusually cold period in January when a line froze and monitor gave meaningless results, there were only 6 days in FY00 when a DO below 6.0 was recorded, only one day when a DO below 5.0 was reported, and the minimum recorded was 4.91 ppm.

There are monitors at the tunnel's inflow and exit shafts, but only the inflow monitor has been usable because of problems with the recirculation pumps at the outlet shaft. In September 2000 those problems were corrected and the outlet monitor began supplying useful data. Comparison of the inlet and outlet monitors shows good agreement. Because of the arrangement of the recirculation pumps, the outlet monitor receives a high proportion of fresh water than the inlet monitor does, and this results in differences in conductivity and temperature readings.

NAE will continue sending AWQM data to the DEP until the tunnel is turned over to the MDC. However, even after the transfer occurs, NAE will use the computer connection to keep an eye on water quality conditions.

d. Town Brook Smelt Spawning. Due to concerns about the Town Brook local protection project's potential to affect flows in smelt-spawning areas of Town Brook, a smelt conservation team was formed in 1998. This team had members from the Corps, City of Quincy, MDC,

Massachusetts Division of Marine Fisheries, and U.S. National Marine Fisheries Service. In FY00, NAE reconstructed part of the Centre Street junction structure, a portion of the nonfederally-constructed local protection project, to improve its reliability in providing sufficient flow for spawning.

e. Parker Pond. Parker Pond in north central Massachusetts is heavily filled in with sediment and suffers from severe aquatic weed problems, especially the nonnative weed fanwort. The combination has greatly restricts habitat for aquatic animals, especially fish. Under authority in section 206 of the 1999 Water Resources Development Act, NAE is planning means to improve the pond. Results based on past studies and water quality and fish sampling by the Corps indicate that selective dredging to deepen the pond and remove aquatic plants and nutrient-laden sediments will improve the lake's biodiversity including the return of several fish species. The draft report on water quality improvements expected from dredging was completed in FY00.

f. Superfund Site Studies. Water quality concerns are a major part of Superfund projects. Contaminated soil and groundwater are the most commonly encountered problems. Because of ground water mobility, water quality can be both the most important and complicated aspect of cleanups. In FY00 WMS was involved in long term monitoring studies at Baird and McGuire and cleanup of the continuing source areas at the Nyanza Chemical Company sites in Massachusetts. WMS was also involved in groundwater sampling as part of long-term monitoring of the cleanup of former military sites in Massachusetts and Rhode Island.

g. Northfield Brook Lake Beach-Closure Protocol. Historically Northfield Brook Lake has had water quality problems linked to watershed development and lack of municipal sewerage, and these are related to the frequent high bacteria counts at the beach after rainfall events. NAE looked at the historic relationship between rainfall and developed protocols for opening and closing the beach based on rainfall amounts. Recently the watershed has experienced positive changes such as increased municipal sewerage coverage, and negative changes in the form of accelerating development. These changes have raised questions about whether the protocols need revision. Consequently, during FY00 NAE collected extra samples after rainfall events not only at the beach, but also at various places in the watershed. These extra samples will help determine if the beach-closure protocols need revision, and if there are particular places in the watershed that contribute high bacteria counts or if they are a general phenomenon. Collected data will be analyzed in FY01, and then recommendations will be made.

h. Northfield Brook Lakewatch. The Project Manager was concerned that siltation and other problems were degrading the project's fishery and beach, but he was not sure how to address them. The State of Connecticut stocks the lake as a put-and-take trout fishery, but there was no data on the actual species composition in the lake or the condition of the warmwater fishery. Without data it was difficult to evaluate the problem much less possible solutions. In addition, attendance at Northfield Brook Lake's beach has been falling in recent years and the Project Manager wanted advice on improving the beach. Consequently he requested a Lakewatch study to look at ways to improve the project's fishery and beach.

The requested study performed water quality profiles in the lake, examined the fishery through electro-shocking, and examined the physical condition of the beach. Results from the fishery portions of the study will be analyzed in FY01, but a list of recommendations for improving the beach was given to the Project Manager in August. These recommendations include changes to the drainage and beach layout that will improve the appearance and water quality at the swimming area.

i. Hop Brook Lakewatch. Water quality conditions at Hop Brook Lake have changed, possibly significantly, as evidenced by fewer reports of potentially toxic algal blooms and fewer beach closures over the last several years. As algae and other microorganisms form the very base of the food chain, this indicates a change in the lake's ecosystem. Lakewatch provides a picture of conditions at the top of the food chain through fisheries analyses, as well as water quality conditions in the lake. Combining lake water-quality profiles and nutrient analyses in a Lakewatch study with baseline data already scheduled for collection in the watershed in FY00, will provide a more complete view of the effects of the watershed dynamics on the lake. Fishery sampling in the lake in the late 1970's and early 1980's revealed a good warmwater fishery based on the chronically enriched condition of the lake. These nutrients supported a food web of forage fish and population of largemouth bass. Data also indicated stocked salmonids migrated from the lake into Welton Brook, one of the lake's main tributaries, during warm summer conditions to establish naturally breeding populations. A lack of relevant recent data combined with the continued high fishing pressure on the lake caused the Project Manager to request a Lakewatch study to determine the status of this fishery as an essential aid for any management decisions.

Results from the watershed and fishery portions of the study will be analyzed in FY01. However, indications of a possible return of nuisance algal blooms were found, and a recommendation was made to the Project Manager to consider expanding the wetland at the inflow to the lake to enhance its ability to remove nutrients.

j. North Hartland Lake Studies. North Hartland Lake is experiencing an increasingly heavy growth of rooted aquatic vegetation within the upper reaches of the lake, indications of developing algal bloom problems, and a lack of largemouth bass despite sufficient forage fish and breeding area. In FY00 NAE addressed these problems through a combination of watershed sampling and the Lakewatch program. The search for possible high phosphorus inflows in the watershed that might be responsible for the aquatic weed and algal problems was hampered in past years by quality control problems at the contract laboratories. In FY00, NAE began using the Vermont State Laboratory for phosphorus analysis. Their state-of-the-art equipment gives reliable results with an order of magnitude more accuracy.

Sampling of the Ottauquechee River upstream from the project boundaries did not find any especially high nutrient sources. Results from lake profiles showed that nutrient values are elevated but only approaching levels likely to cause accelerated eutrophication. Much rooted

vegetation remains in George Perkins Marsh area at the upstream end of the lake, but none of the floating mats of blue green or blue-green algae seen in the previous couple of years were visible in FY00. It could be the cool, wet conditions experienced in the summer of 2000 or that something changed in the watershed.

At the upstream end of the project, before the river goes through the gorge and into North Hartland Lake, is Deweys Pond. The Ottauquechee River does not flow through the pond except during high flow events when the dike is overtopped, and the effects of water quality conditions in the pond on North Hartland Lake are not clear. However, they may be important because phenomenal aquatic macrophyte growth was observed in the pond. A high nutrient source must be available to support these plants, but it is not clear what this source is or whether a significant amount of these nutrients make it into the lake. Additional sampling will be required to resolve that.

The condition of the lake's fishery was examined using gill netting, seining, and electrofishing. Initial results indicate similar conditions to those seen in the last sampling in the lake. The area upstream of the beach has a large white sucker population while the two bays on the east side of the George Perkins Marsh Area supported members of the bass family including blue gills and pumpkinseeds, but no young-of-the year bass. North Hartland appears to have the potential to support a largemouth bass fishery if a breeding population is established and if the proper management procedures are employed. The Deweys Pond area could provide a nursery for a largemouth bass population in the lake. A possible next step is to seek Vermont's approval to transport yearling bass from North Springfield Lake or Stoughton Pond to stock North Hartland Lake, and to follow the population.

k. Muddy River Study. The Muddy River, a minor tributary to the Charles River, is located within a series of Boston area parks referred to as the "Emerald Necklace," designed by the 19th century's most famous landscape architect, Frederick Law Olmsted. Although it begins in the clean, spring-fed waters of Jamaica Pond, water quality along most of its length is very poor due to uncontrolled urban drainage and cross connections to sanitary sewers. In addition, the small drainage area, minimal channel slope, and presence of a series of small ponds, minimize flushing. These conditions have resulted in the buildup of large areas of septic sediments, which further degrade water quality.

The City of Boston, in association with the Town of Brookline and public interest groups, created a master plan for an extensive rehabilitation of the Emerald Necklace parklands in January 1999. This plan includes rehabilitation of bridges, restoration of historic structures, and landscape and traffic improvements. As a first phase, the plan proposes to improve water quality and aquatic habitat, and reduce flooding through a bank-to-bank sediment-dredging project.

In FY00 NAE reviewed this proposal to see if it was in the Federal interest to dredge the Muddy River. WMS contracted with the firm of Camp, Dresser and McKee, Inc. (CDM) for

technical analyses related to this review. NAE concluded this dredging project was in the Federal interest based on water quality and flood control benefits. CDM is designing the details for the dredging, and actual work in the river could occur within the next two years.

l. Mansfield Landfill. The Connecticut Department of Environmental Protection (CTDEP) is investigating the old Mansfield landfill. Located on the north side of the Fenton River, it is just off Corps Mansfield Hollow Lake property, but CTDEP has received reports that an underground leachate plume from the landfill may be moving into the Corps project area. The Town of Mansfield has been collecting data in the Fenton River and from four groundwater-monitoring wells, and a consultant's study showed a plume of low pH groundwater going under the Fenton River and into Corps property. They are concerned that the low pH may facilitate or lead to the leaching and mobilization of heavy metals. However, it would be an unusual hydrologic condition that would cause a groundwater plume to move under a river, and the CTDEP is not convinced that the monitoring wells are properly located to determine what is actually happening. Currently NAE is reviewing and sharing data with CTDEP. The Mansfield Hollow Lake priority pollutant scan did not show a problem with heavy metals, but sampling stations were not located to specifically look at the possible effects of the landfill. If CTDEP concludes that a contaminant plume is moving into Mansfield Hollow Lake, they may request Corps permission to install wells or cutoff walls on NAE property. As long as CTDEP continues to take the lead in this investigation, NAE will restrict its activities to coordination and review of data.

m. Sagamore Salt Marsh Restoration. Construction of the Cape Cod Canal in the 1930's caused significant degradation of the Sagamore salt marsh, when excavated material placed in the marsh changed the direction of wetland drainage and restricted saltwater exchange. Before the canal, the Scusset River drained the marsh into Cape Cod Bay, but dredged material disposed of in the marsh directed the river away from the Marsh and limited tidal flows to what could pass through two 48-inch culverts. Reduced tidal inflows changed the nature of the marsh from a saltwater to a mostly freshwater environment. Under authority in the Water Resources Development Act of 1986, the Corps began investigations of means to restore the salt marsh without flooding homes or yards, or impacting water supply wells around the marsh. Computer modeling by WMS was an essential part of this restoration plan. The construction phase of the salt marsh restoration began in FY00, when NAE began monitoring pre-project conditions and developing a plan for monitoring post restoration conditions.

n. Rhode Island Salt Pond Restoration. In FY98 NAE completed a reconnaissance study to restore eelgrass in certain salt ponds along the Rhode Island coast. Siltation and channel restrictions have reduced tidal inflows, and this has reduced the extent of eelgrass beds, which are important nursery areas for many species. Selective dredging would increase saltwater inflows. In FY99, NAE began the feasibility study, and in FY00 WMS modeled sediment transport. Environmental restoration studies of the ponds are nearing completion.

o. Turner Reservoir. At the request of the City of East Providence, Rhode Island, the Corps

began preliminary investigations of the feasibility of using Turner Reservoir for public water supply or more intensive recreation. The water's appearance is not attractive, with large amounts of aquatic weeds and numbers of waterfowl. However, Corps investigations, including water quality and fish sampling, did not find any water quality problems that would prohibit using Turner Reservoir for recreation including swimming, or for public water supply. The draft report on water quality was completed in FY00.

p. Yarmouth Salt Marsh Restoration. In FY00, WMS initiated work on a feasibility study to restore the ecology and health of Run Pond, a coastal salt pond with surrounding salt marsh in Yarmouth, Massachusetts. Over twenty years ago when the town constructed a boat ramp and parking lot, they replaced the existing channel with a 900-ft long, 36-inch diameter culvert. This culvert has significantly less capacity than the old channel and restricts tidal flushing of the pond, which experiences extensive algal blooms each summer. WMS performed numerical modeling of tidal flow into and out of the salt marsh in FY00, evaluating various culvert alternatives to improve tidal flushing. The current schedule calls for completion of the feasibility report in FY01, plans and specifications in FY02, and construction in FY02 and FY03.

q. Providence River Dredging Studies. WMS is studying disposal locations for dredged material from the Providence River in Rhode Island. This involves the use of complex computer programs to model sediment movement, and physical studies of sediment characteristics. The effects on water column concentrations of sediment and copper were analyzed using the Single dump Fate (STFATE) model, which was also used to simulate the expected footprint and sediment layer thickness. The SURGE model was used to estimate the bottom energy from a single confined aquatic disposal (CAD) cell disposal simulated using the STFATE model. Energy dissipation was used to predict the amount of sediment that will move outside the CAD cell walls. The LTFATE model was used to make long-term erosion predictions for the site. Studies are mostly finished, and are being incorporated into a final EIS, which should be published in 2001.

10. **Water Quality Classification.**

The water quality conditions in each project have been classified in accordance with the following criteria:

(1) Class I : (a) High Water Quality, &
(b) No Known Problems

(2) Class II: Generally Good Water Quality

(3) Class III : (a) Fair Water Quality &
(b) Requires Close Monitoring of Trends and Careful Examination of Problems

Following is a list of projects evaluated according to the above classifications.

	RESERVOIRS/LAKES		
CLASSIFICATION/ DISTRICT	**I**	**II**	**III**
NAB	Savage Lake, MD.	Almond Lake, NY. Alvin R. Bush Lake, PA East Sidney Lake, NY Cowanesque Lake, PA Raystown Lake, PA F.J.Sayers Lake, PA Stillwater Lake, PA Whitney Point Lake, NY.	Aylesworth Creek Lake, PA Jenning Randolph Lake, WV Tioga-Hammond Lakes, PA Curwensville Lake, PA
NAE	Ball Mountain Lake, VT Blackwater Reservoir, NH North Springfield Lake, VT Franklin Falls Reservoir, NH Townshend Lake, VT Barre Falls Reservoir. MA Otter Brook Lake, NH Conant Brook Reservoir, MA Surry Mountain Lake, NH Hodges Village Reservoir, MA Knightville Reservoir, MA Edward MacDowell Lake, NH Black Rock Lake, CT West Hill Reservoir, MA Colebrook River Lake, CT Westville Lake, CT Hancock Brook Lake, CT Everett Lake, NH Mansfield Hollow Lake,CT Littleville Lake, MA	North Hartland Lake, VT Thomaston Reservoir, CT Hopkinton Lake, NH Buffumville Lake, MA Tully Lake, MA East Brimfield Lake, MA	Birch Hill Reservoir, MA Hop Brook Lake, CT Northfield Brook, CT Union Village Reservoir, VT West Thompson Lake, CT
NAO	NONE	Gathright Dam & Lake Moomaw	NONE
NAN	NONE	NONE	NONE
NAP	NONE	Prompton Lake F.E.Walter Reservoir	Beltzville Reservoir Blue Marsh Reservoir